

Performance measurement systems, TQM, and multi-level firm performance: a person-organisation fit perspective

Article (Accepted Version)

Wei, Jo-Ting, Chang, Yeun Wen, Zhang, Xiaoxiang and Wu, Hsin-Hung (2017) Performance measurement systems, TQM, and multi-level firm performance: a person-organisation fit perspective. Total Quality Management & Business Excellence. ISSN 1478-3363

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**Performance measurement systems, TQM, and multi-level
firm performance: A person-organisation fit perspective**

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Performance measurement systems, TQM and multi-level firm performance: A person-organisation fit perspective

For firms implementing TQM, there is a need to redesign performance measurement systems (PMS). Innovated PMS ought to have measurement diversity in their structure with considering the spirit of TQM and emphasize the congruence of goals between employees and firms by adding the viewpoint of person-organisation fit (P-O fit). This paper adopts structural equation modeling (SEM) to examine Taiwanese manufacturing firms to study the association between the P-O fit of PMS and the implementation of TQM, as well as the effects of the adaptation of both to firm performance. Particularly, this paper examines firm performance at multiple levels and gathers data from multiple sources, including archival files and self-reported data from surveys.

Keywords: total quality management; performance measurement systems; person-organisation fit; multi-level firm performance

Introduction

Total quality management (TQM) is not only the management philosophy that can assure continuous improvement of operating activities in a whole organisation but also the culture that an organisation commits to enhance customer satisfaction (Chen, 2015; Singh & Sushil, 2013). TQM aims at enhancing quality to meet customer demand and thus can achieve excellence firm performance (Mehralian et al., 2017). Firms can increase competitiveness and compete with others by implementing TQM (Sadikoglu and Olcay, 2014). Although the benefits of TQM have been widely proposed, past findings on the association between TQM and firm performance are mixed (Benavides-Velasco et al., 2014; Dubey, 2015; Jaca & Psomas, 2015).

In order to identify the association between TQM and firm performance, this paper utilizes structural equation modeling (SEM) techniques and follows prior literature to examine firm performance at multiple levels (Karimi et al., 2014; Kaynak, 2003; Sadikoglu & Olcay, 2014), including financial performance, quality performance and inventory management performance. Taking the research design problems into account (Wayhan & Balderson, 2008), this paper collects data from various sources, including archival files and self-reported data from surveys.

It is widely recognized that ill-designed performance measurement systems (PMS) are the major reason to result in ineffective TQM. It is necessary for firms executing TQM to innovate PMS with considering financial and non-financial indicators so as to measure performance comprehensively (Anderson & Sedatole, 1998; Mehralian et al., 2017; Pimentela & Majora, 2014). Furthermore, the motivation and commitment factors in TQM have been emphasized in the literature (Zelnik et al., 2012). According to the viewpoint of person-organisation fit (P-O fit), the fit of opinions between employees and firms facilitates effective execution of firm policies (e.g., TQM) and the achievement of predetermined outcome (Kim et al., 2013). P-O fit represents the coherence or the match between a person and an

organisation (Peng et al., 2014). If employees recognize what they can be rewarded due to successful execution of TQM, TQM can become the common goal between employees and firms (Hoque, 2003). This perspective is consistent with well-designed PMS, emphasizing that rewards should be linked to targets (Pimentel & Major, 2014). Accordingly, in order to attain TQM effectiveness successfully, firms must consider P-O fit viewpoint when redesigning PMS.

On the other hand, based on the study of Ukko et al. (2007), operating with PMS, the enhanced interactivity between the management and employees can lead to better firm performance. This shows that innovative PMS facilitate improve firm performance when incorporating P-O fit viewpoint. According to the above, this paper examines the linkage of P-O fit of PMS both to TQM and multi-level firm performance. P-O fit of PMS refers to the degree that the recognition compatibility of the importance of PMS between employees and firms. Due to the importance of the performance measurement diversity (Mandy & Humphreys, 2016) and considering TQM spirit in the design of PMS (Shin et al., 2000; Pesic & Dahlgaard, 2013), this paper develops innovative PMS by combining two widely known PMS: the balanced scorecard (BSC) (Mehralian et al., 2017; Pimentela & Majora, 2014) and the Malcolm Baldrige Criteria for Performance Excellence (MBCPE) (Thompson and Blazey, 2017) to include five dimensions: financial, customer, internal process, learning & growth and supplier.

This study examines Taiwanese manufacturing firms as quality management practices have been popular and widely adopted in Taiwan (Dahlgaard et al., 2015) and the manufacturing industry is expected to make a wider range of TQM practices (Ooi et al., 2012). Our results indicate that P-O fit of PMS has positive effects on the implementation of TQM and multi-level firm performance. Furthermore, the implementation of TQM can increase multi-level firm performance. Our findings are valuable references for the manufacturing industry that aims to

execute TQM successfully and enhance firm performance.

The definitions of TQM, P-O fit of PMS and multi-level firm performance

Total quality management (TQM)

TQM is defined as continuous quality improvement in products or services within organisations to enhance customer value and satisfaction and finally achieve superior firm performance (Mehralian et al., 2017; Ng et al., 2014). It is widely recognized that TQM is a multidimensional construct (Hietschold et al., 2014; Jaca & Psomas, 2015; Kaynak, 2003). Following prior literature (Hassan et al., 2013; Jaca & Psomas, 2015; Kaur and Sharma, 2014; Kaynak, 2003; Singh & Sushil, 2013), in this paper, TQM includes multiple dimensions: management leadership, training, employee relations, quality data & reporting, supplier quality management, product/service design, and process management.

Management leadership, training, and employee relations are corporate management related dimensions. The management plays a crucial role in providing resources, core values and policies to signal employees the importance of TQM implementation. All quality activities begin with the leadership level and thus management leadership is a major key to the successful execution of TQM (Hietschold et al., 2014). Management leadership is also called management commitment, which refers to the factors that measure the participation and the support for quality improvement and evaluation of firm executives' heads (Jaca & Psomas, 2015; Kaynak, 2003; Singh & Sushil., 2013).

Successful TQM implementation relies heavily on employee skills. Employees must acquire the competencies relevant to TQM via receiving training so as to acquire knowledge and skills to solve problems encountering in the implementation of TQM more efficiently. Training refers to employee training pertaining to quality management, such as the offer of the

statistical training, quality-related training and specific work-skills training for employees. In addition, employee attitude on TQM and whether employees have the authority to deal with the problems encountering in executing TQM can also significantly affect TQM effectiveness. Employee relations identifies factors such as the implementation of employee involvement, employee participation, employee recognition and employee empowerment in quality activities (Faisal et al., 2011; Hietschold et al., 2014).

Quality & data reporting, supply quality management, product/service design, and process management are manufacturing process related dimensions. Strengthening corporate management related dimensions facilitates the implementation of manufacturing process related dimensions in TQM. For example, quality data & reporting requires employee training to provide continuous improvement of quality because only employees are trained in TQM-related knowledge and skills, they can understand, analyze and prepare quality data & reporting well (Kaynak, 2003). The timely and reliable preparation of quality data & reporting helps monitor existing quality status of products or services. Firms can evaluate and understand the quality of products or services timely and accurately by examining quality data & reporting. Quality data & reporting is related to quality data such as cost of quality, rework and scrap, timeliness of the quality data, and feedback for problem solving (Ebrahimi & Sadeghi, 2013; Jayaram et al., 2010).

Except for employees, vendors are also a main source of quality problems. Therefore, supplier quality management becomes an essential factor in helping achieve effective TQM. Supplier quality management concerns the establishment of long and stable relationships with suppliers and finally assures the provision of good-quality products or services (Hietschold et al., 2014; Shahin & Dabestani, 2011). Besides, good product/service design implies that customer demand can be met. Firms have to know customer opinions about products or services so as to design products or services that can achieve customer desires on products or

services. Product/service design includes factors such as product/service quality characteristics with knowledge of customer requirements for products or services, and with an emphasis on fitness for use. Furthermore, it's necessary for management to avoid any operating errors occurring in the process. This suggests that process management is crucial to avoid TQM failure. Process management involves adopting statistical techniques to control the production processes and reduce the process variation and using preventive maintenance to improve quality and avoid the breakdown in equipment (Faisal et al., 2011; Hietschold et al., 2014; Valmohammadi, 2011).

Person-organizaition fit of performance measurement systems (P-O fit of PMS)

P-O fit of PMS refers to the recognition congruence of the importance of PMS between employees and firms. P-O fit has received much interest in the management literature. P-O fit refers to the level of the congruence that persons perceive between their own values and the values of the organisation (Boon & Biron, 2016; O'Reilly et al., 1991). In other words, P-O fit is defined as the extent to which an individual and an organisation have similar features or measures the level of match between a person and an organisation (Kim et al., 2013; Peng et al., 2014).

PMS refers to performance measurement systems, which build multiple performance indicators to assess how well firms can achieve strategy (Mandy & Humphreys, 2016). PMS play an important role in aligning firms' operations with their strategic directions. The literature on PMS concerns with the use and the structuring of financial measures and non-financial measures in performance measurement. Financial measures are lagged measures that report traditional financial indicators such as sales growth, profitability and risk. Conversely, non-financial measures are leading measures that provide information relevant to

future performance such as customer satisfaction (Pimentel & Major, 2014; Thompson & Blazey, 2017).

It has been widely recognized that PMS should adopt multiple measures. The BSC and the MBCPE are often used to evaluate the performance measurement diversity by including non-financial measures as one part of firm reporting systems. The BSC facilitates firms integrate performance, evaluation and incentives, which falls into four dimensions: financial, customer, internal process, and learning & growth. Financial dimension identifies financial measures concerning firm profitability. Customer dimension directs attention to customer need and satisfaction as well as market share. Internal process dimension emphasizes the methods and practices adopted in firms to create value and examines how to improve the processes. Learning & growth dimension identifies the infrastructure that firms must build to create long-term growth and assesses employee ability, information systems, and procedures to manage business (Kaplan & Norton, 1992; Mandy & Humphreys, 2016; Mehralian et al., 2017).

The MBCPE groups PMS into five categories: customer, financial & market, human resources, suppliers & partner performance, and organisational effectiveness. Firms focusing on TQM highlight more on building good collaboration with suppliers. Supplier dimension measures the effectiveness of suppliers, encompassing on-time delivery and the quality of raw materials (Evans, 2004; Thompson and Blazey, 2017). Hence, by integrating the dimensions of BSC and MBCPE with considering the spirit of TQM in PMS (Pesic & Dahlgaard, 2013; Shin et al., 2000; Thompson and Blazey, 2017), this paper proposes that innovate PMS for firms executing TQM should include five dimensions: financial, customer, internal processes, learning & growth, and supplier to assess firm performance.

Multi-level firm performance

When examining the association between TQM and firm performance, Kaynak (2003) examines firm performance at three levels: financial & market performance, quality performance and inventory management performance. Similarly, Calvo-Mora et al. (2014) examine the relationship between TQM and firm performance in three dimensions, including quality performance, operational performance and economic-financial performance. Bolboli & Reiche (2013) investigate the linkage of TQM to the following firm outcome: operational cost, productivity, efficiency & growth, market share & profits, and innovation development.

Further, Sadikoglu & Olcay (2014) examine how TQM is related to six dimensions of firm performance: inventory management performance, employee performance, innovation performance, social responsibility performance, customer results, and market & financial performance. In the similar way, Karimi et al. (2014) investigate whether TQM is associated with six outcomes, including financial & market outcomes, product & service outcomes, customer-focused outcomes, organisational effectiveness outcomes, human resource outcomes, and social responsibility outcomes. Jaca & Psmoas (2015) examine the effect of TQM on firm performance at four dimensions, including financial performance, customer satisfaction, product/service quality performance and operational performance. Based on the above studies, this paper focuses on three dimensions of multi-level firm performance: financial performance, quality performance and inventory management performance.

Literature review and hypotheses development

Alignment of TQM with P-O fit of PMS

Although TQM is learning-oriented, learning failure often occurs in firms executing TQM. The main reason is the adoption of poorly designed PMS (Mehralian et al., 2017). Innovated

PMS can help achieve TQM strategy successfully (Anderson & Sedatole, 1998; Pimentel & Major, 2014). Traditional PMS focus solely on financial metrics and thereby support cost and production analysis well rather than quality analysis and problem-solving. Increasing stress on the use of the combination of financial and non-financial performance measures has been discussed (Mandy & Humphreys, 2016). Non-financial measures such as quality-related elements are vital to innovate PMS of firms implementing TQM (Pesic & Dahlgaard, 2013).

Well-designed PMS should recognize and reward achievement of employees in delivering firm success and connect the interests of firms with those of employees (Hoque, 2003). Firms striving to execute TQM should highlight the reward system and the communication between employees and firms so as to motivate employees to be highly involved in TQM activities (Mehralian et al., 2017). The evidence from Chhabra (2016) shows that matching employees to their organisation and job facilitates the decrease of employees' stress, leading to high employee outcomes, hence having benefits on the organisation. This reveals that P-O fit can result in positive employee outcomes. P-O fit is typically referred to the degree of match or compatibility between individuals and an organisation or value congruence between employee values and organisational values (Boon & Biron, 2016). From the viewpoint of P-O fit, employees would have positive behavior and would like to comply with company policies and activities if the goals and values of employees and those of firms are coherent and aligned (Kim et al., 2013; Peng et al., 2014).

As TQM focuses on employee participation, commitment and satisfaction (Singh & Sushil, 2013), firms implementing TQM should use the PMS recognized by their employees so that can execute TQM successfully (Mehralian et al., 2017). This shows that the match of the recognition of the importance of PMS between employees and firms (referring to P-O fit of PMS) is important. Accordingly, P-O fit of PMS can significantly affect the effectiveness of TQM. This paper develops the following hypothesis.

Hypothesis 1: The greater P-O fit of PMS is, the greater benefit to the implementation of TQM will be.

The relationship between TQM and multi-level firm performance

Prior studies examining the relationship between TQM and firm performance show mixed evidence. In order to clarify the above association, it is necessary to examine firm performance in multiple levels rather than in a single construct (Jaca & Psomas, 2015; Karimi et al. 2014; Kaynak, 2003; Sadikoglu & Olcay, 2014). This paper proposes that TQM has positive impacts on the following multi-level firm performance, including financial performance, quality performance and inventory management performance.

The impacts of TQM on financial performance have been concerns in the literature, asserting that excellent firm profitability can be achieved by improving quality practices (Wayhan et al., 2013). Moreover, there is no much debate that firms can enhance quality performance by implementing TQM. When incorporating quality into products, firms can reduce the occurrence of products with poor quality (Calvo-Mora et al., 2014; Jaca & Psomas, 2015; Ng et al., 2014). TQM also plays a crucial role in achieving good inventory management performance. The adoption of TQM facilitates sustain waste reduction, eliminate safety stocks, and create a leaner operation (Kaynak, 2003; Sadikoglu & Olcay, 2014). Therefore, the following hypotheses are established:

Hypothesis 2a: The implementation of TQM has positive effects on financial performance.

Hypothesis 2b: The implementation of TQM has positive effects on quality performance.

Hypothesis 2c: The implementation of TQM has positive effects on inventory management performance.

Association between P-O fit of PMS and multi-level firm performance

PMS ought to encourage actions which are congruent with firm strategy such as TQM. In order to surpass firms' competitors, firms have to focus on their mission and vision by redesigning PMS with measurement diversity in their structure to align with firm strategy (Hoque, 2003; Mehralian et al., 2017; Pimentel & Major, 2014). When innovating PMS, firms should consider P-O fit viewpoint so as to achieve high performance.

Based on the viewpoint of P-O fit, a strong match between individual values and organisational values results in strong employee commitment, which in turn, leads to high organisational outcome (Peng et al., 2014). The benefits of employing people who can fit well within a firm have been widely recognized. An organisation satisfies employees' needs, desires, or preferences and thus employees feel that they fit in and then become part of the organisation. A majority of studies have provided strong support for the positive linkage of P-O fit to firm outcomes, including work satisfaction, employee performance and organisational performance (Boon & Biron, 2016; Chhabra, 2016; Kim et al., 2013; O'Reilly et al., 1991). Accordingly, this paper develops the following hypotheses.

Hypothesis 3a: The more P-O fit of PMS is, the greater benefit of financial performance will be.

Hypothesis 3b: The more P-O fit of PMS is, the greater benefit of quality performance will be.

Hypothesis 3c: The more P-O fit of PMS is, the greater benefit of inventory management performance will be.

Methodology

The sample

The data used in this study were randomly selected from the top 1000 manufacturing companies in Taiwan reported by Commonwealth Magazine published on May 7 2008 (No.396) (Commonwealth, 2008), a renowned magazine providing analyses of industrial management, technology and financial trend of Taiwan industry. A pilot test was performed with using eight EMBA students of a major university in southern Taiwan. The sample was purposeful as their work is or was involved with quality management activities and they average at least eight years of managerial experience. After some modification based on their feedback, we decide the description of items in the questionnaire.

Much examination on TQM is conducted via collecting self-reported data from surveys rather than archival files and thus respondents' assessments may be biased (Wayhan & Balderson, 2008). Therefore, we collected data from multiple sources. Financial performance data were collected from the Taiwan Economic Journal (TEJ) financial database. The other data were collected via the questionnaires.

Besides, two kinds of questionnaires with stamped and self-addressed envelopes were individually provided to the factory supervisor and the production manager in the same firm. The questionnaire including only the items on the recognition of the importance of PMS from the employee perspective was provided to the factory supervisor whereas the other questionnaire including those from the firm perspective and items on TQM practices, quality performance and inventory management performance was provided to the production manager.

It took about two months to carry out and collect the questionnaires. Two weeks later, we made a follow-up call. The sample returned was 184 employee-supervisor pairs. After eliminating responses with any missing data, 171 usable questionnaires were gathered for an effective response rate of 17.1%. Table 1 summarizes the sample characteristics in terms of industry sub-categories, number of employees and average sales revenues over the last two years (2007-2008). Following Fowler (1988), we assessed the non-response bias. The early

and late responses were compared in terms of sample demographics and each construct. The results showed no significant differences between the early and the late responses ($p < 0.1$), indicating no non-response bias in this study.

Insert Table 1

The measure

Person-organisation fit of performance measurement systems (P-O fit of PMS)

There are two techniques to measure P-O fit: direct measurement and indirect measurement. The technique for indirect measurement of P-O fit is to calculate the differences between the assessment on organisational values and that on individual values. This study employs the indirect measurement technique to assess P-O fit of PMS due to the advantage of lowering consistent response bias (Edwards, 1991). P-O fit of PMS is defined as the recognition coherence of the importance of PMS between employees and firms. We illustrate P-O fit of PMS in Figure 1, adapted from Ukko et al. (2007) and modified based on our focus.

Insert Figure 1

As previously mentioned, firms implementing TQM can innovate PMS by adopting five PMS dimensions: financial, customer, internal process, learning & growth and supplier. According to the literature on PMS (Evans, 2004; Kaplan & Norton, 1992; Mandy & Humphreys, 2016; Shin et al., 2000), 12 items were chosen to measure the recognition of the importance of PMS (see Appendix). In order to determine P-O fit of PMS, the differences between absolute values of responses on the recognition of the importance of PMS from the firm viewpoint and those from the employee viewpoint were calculated. Reverse scores were assigned in order to maintain uni-dimensionality of the scales within a construct. The responses were converted to numerical values, ranging from 1 (the least match) to 7 (the most match). Then, we individually averaged the converted values on each dimension of PMS to

get the value of P-O fit of PMS for each dimension of PMS.

Total quality management (TQM)

As mentioned earlier, this paper examines TQM in a multi-dimensional construct, including management leadership, training, employee relations, quality data & reporting, supplier quality management, product/service design, and process management. This paper chose 12 items identified by Kaynak (2003) to measure TQM dimensions. The respondents were asked to rate on a 7-point Likert scale, ranging from 1 (the least important) to 7 (the most important) (see Appendix).

Multi-level firm performance

This paper uses return on assets (ROA) and stock return over the last two years (2007-2008) to examine financial performance. Financial performance data were collected from the TEJ financial database. Besides, subjective data for quality performance and inventory management performance were collected via the questionnaire due to data availability. Based on prior studies (Ho et al., 1999; Kaynak, 2003), this paper chose four items to measure quality performance and two items to measure inventory management performance. The items were rated on a 7-point Likert scale, ranging from 1 (the worst) to 7 (the best) (see Appendix).

The validity and reliability

We tested the model by using structural equation modeling (SEM). Firstly, we proceeded confirmatory factor analysis (CFA) with observed variables conducted using maximum likelihood estimation. We deleted items not correspond to the threshold level suggested by

corrected item-total correlation (0.4) or factor loading (0.5) (see Appendix). After redefining the instruments, items retained were analyzed. Table 2 provides an overview of the means, standard deviations and correlations of the constructs.

Insert Table 2

It is important to purify measures at an early stage of studies. Therefore, we examined the construct validity of each item by checking corrected item-total correlations. All corrected item-total correlations were above the stringent level of 0.4. Moreover, all factor loadings were significant ($p < 0.01$), indicating that observed variables were convergent in representing their underlying constructs and thus had good convergent validity. Next, the reliability of the constructs was evaluated. The values of total Cronbach's alpha and composite reliability were above the threshold value of 0.7.

Furthermore, the values of all average variance extracted (AVE) were higher than the threshold value of 0.5 level, except for P-O fit of PMS. Taken as a group, the constructs in this model performed fairly well. The results, presented in Table 3, point out that the constructs have good reliability. Moreover, Table 4 reported that the variances extracted by constructs were greater than any squared correlation among constructs, implying good discriminate validity.

Insert Table 3 and Table 4

Analysis of the structural model

Firstly, we tested data normality. The values of skewness and kurtosis of all items were in reasonable ranges, which were below 3.0 and 10.0, respectively. Next, we examined the fit measures for the measurement model, shown in Table 5. The χ^2 value was insignificant ($p > 0.1$), indicating that the actual and predicted matrices were not statistically different. Absolute fit measures were evaluated by the χ^2 /d.f., goodness of fit index (GFI), root mean

square error (RMR), and root mean square error of approximation (RMSEA). Incremental fit measures were measured by the normalized fit index (NFI), incremental fit index (IFI), adjusted goodness of fit index (AGFI) and the comparative fit index (CFI). Parsimonious fit measures were evaluated by parsimonious goodness of fit index (PGFI) and parsimonious normal fit index (PNFI). All the fit measures fell into acceptable ranges, suggesting that the proposed model provides a good fit.

Insert Table 5

Table 6 shows the path coefficient and t-value of each hypothesized path. All hypotheses are supported. Pertaining to H1, our results show that P-O fit of PMS is positively related to TQM ($\beta=0.226, p<0.05$). Furthermore, the results of H2 and H3 indicate that TQM and P-O fit of PMS both have positive effects on financial performance ($\beta=0.603, p<0.05$; $\beta=0.591, p<0.01$), quality performance ($\beta=0.288, p<0.01$; $\beta=0.266, p<0.01$), and inventory management performance ($\beta=0.527, p<0.01$; $\beta=0.168, p<0.1$). Consistent with prior studies on TQM (Jaca & Psomas, 2015; Kaynak, 2003; Sadikoglu & Olcay, 2014) and P-O fit (Boon & Biron, 2016; Chhabra, 2016), P-O fit of PMS can lead to the successful implementation of TQM and excellent firm performance at multiple levels. In addition, TQM can enhance multi-level firm performance. Further, Table 7 showed the direct, indirect and total effects of all model constructs, revealing that TQM is a crucial intervening variable in the relation between P-O fit of PMS and multi-level firm performance. Figure 2 provides the conceptual model with parameter estimates.

Insert Table 6, Table 7 and Figure 2

Conclusions

Different management functions such as operations and marketing have attempted to develop more relevant performance measurement systems (PMS) to their areas of management,

including total quality management (TQM) practitioners (Hoque, 2003; Mehralian et al., 2017). TQM involves continuous quality improvement, increasing customer satisfaction and employee empowerment in a whole organisation (Jaca & Psomas, 2015). Ill-designed PMS act as barriers to TQM execution. Conversely, innovative PMS facilitate the implementation of TQM. The challenge of implementing TQM with changes to PMS has been discussed (Mehralian et al., 2017; Pesic & Dahlgaard, 2013; Pimentela & Majora, 2014).

Person-organisation fit (P-O fit) viewpoint is necessary to be considered in PMS of firms adopting TQM, which refers to the match between a person and an organisation (Kim et al., 2013; Peng et al., 2014). It is suggested that PMS should be in conjunction with common goals between employees and firms so as to execute TQM successfully (Hoque, 2003; Mehralian et al., 2017). Hence, this paper examines the association among P-O fit of PMS and TQM by developing innovated PMS via combining two widely used PMS: the BSC and the MBCPE to link with the firm strategy: TQM and applying the viewpoint of P-O fit. P-O fit of PMS refers to the recognition coherence of the importance of performance measurement systems (PMS) between employees and firms. Following previous studies (Mandy & Humphreys, 2016; Shin et al., 2000; Thompson & Blazey, 2017), this paper proposes that innovative PMS should include five dimensions: financial, customer, internal process, learning & growth and supplier.

The linkage between TQM and firm performance has no concrete conclusions in the literature. This may be attributed to prior examination on TQM or firm performance in a single level (Jaca & Psomas, 2015; Kaynak, 2003; Sadikoglu and Olcay, 2014). In addition, innovated PMS is necessary for firms adopting TQM. P-O fit helps enhance organisational effectiveness (Chhabra, 2016; Kim et al., 2013). This reveals the possibility that P-O fit of PMS can improve performance of firms executing TQM. In light of the above, this paper also examines the linkage of TQM and P-O fit of PMS to multi-level firm performance, including

financial performance, quality performance and inventory management performance.

Our findings suggest that firms adopting TQM should redesign PMS by combining financial and non-financial measures (customer, internal process, learning & growth and supplier) together and considering the spirit of TQM and the viewpoint of P-O fit. P-O fit of PMS is essential to the improvement of both TQM effectiveness and multi-level firm performance. Also, multi-level firm performance can be promoted via highlighting TQM. Pimentel & Major (2014) indicate that non-financial performance measures can capture factors such as flexibility and quality that customers concern. Therefore, our results further reveal that TQM enhances both financial performance and non-financial performance (referring to quality performance and inventory management performance here). Furthermore, our findings also show that P-O fit of PMS has significantly indirect influence on multi-level firm performance via TQM.

This paper has the following contributions. Firstly, our results suggest that firms aiming to execute TQM successfully and enhance firm performance should redesign PMS by adopting both financial and non-financial measures and considering the spirit of TQM and the viewpoint of P-O fit. Our findings suggest that P-O fit of PMS is vital to TQM practitioners. Secondly, our findings fill a void in the TQM literature concerning reward and performance evaluation. Our results indicate that P-O fit of PMS can enhance TQM effectiveness, suggesting that PMS of firms adopting TQM should have measurement diversity in their structure by considering TQM elements and highlight the match of goals between employees and firms. Thirdly, exploring firm performance in multiple levels and collecting data from multiple sources (the questionnaires and database), we provide the evidence to support TQM effectiveness, including financial performance and non-financial performance, and answer a long plea in the literature regarding inconsistent findings on the effectiveness of TQM (Calvo-Mora et al., 2014; Kaynak, 2003; Sadikoglu and Olcay, 2014).

However, this study is limited to examine the manufacturing industry due to our focus. Jaca & Psomas (2015) point out that there should be more investigation on TQM practices in the service industry to provide more insights into TQM practices. Prior literature asserts that there are significant differences in the emphasis on TQM elements and the extent of TQM implementation between the manufacturing industry and the service industry (Talib & Rahman, 2012). For example, based on the findings of Woon (2000), it is likely that the employees and the management in the service industry put lower weight on the element of process management whereas put higher weight on the element of employee training than the manufacturing industry and thus the extent of the implementation of the TQM elements may also be different in the two industries.

Similarly, employees and the management in different industries are likely to put different weights on the importance of each dimension of PMS. There should have differences in P-O fit of PMS between the manufacturing industry and the service industry. According to the statistical data announced by Taiwan National Development Council in 2017 (TNDC, 2017), the GDP accounts for 63.15% and employment population accounts for 59.17% from the service industry. This shows that the service industry faces intense competition in Taiwan. According to the above, there are differences in the emphasis on TQM elements, the extent of the implementation of TQM elements and the emphasis on dimensions of PMS between the manufacturing industry and the service industry. Therefore, future research can duplicate our research framework to investigate the association among P-O fit of PMS, TQM and firm performance in the service industry.

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Appendix: Questionnaire

Performance measurement systems (PMS)

The following is performance measures in the firm you work for:

Based on the firm perspective, please value the items from “1” = the least important through “7” = the most important. (valued by the production manager).

Based on the employee perspective, please value the items from “1” = the least important through “7” = the most important (valued by the factory supervisor).

PMS1. Return on investment.

PMS2. Sales growth.

PMS3. Customer satisfaction.

PMS4. Customer relationship.

PMS5. The identification of target market.

PMS6. Post-sale.

PMS7. Employee satisfaction.

PMS8. Team performance.

PMS9. Cost.*

PMS10. Lead time.

PMS11. On-time delivery.

PMS12. Delivery reliability.*

Total quality management (TQM) (valued by the production manager).

The following is the description about the implementation of TQM in the firm you work for. Please indicate whether the firm emphasizes on the following TQM activities from “1” = the least emphasis to “7” = the most emphasis.

TQM1. Extent to which the organisational top management has objectives for quality performance.

TQM2. Amount of review of quality issues in organisational top management meetings.

TQM3. Quality-related training given to hourly employees throughout the organisation.

TQM4. Extent to which building quality awareness among employees is ongoing.

TQM5. Timeliness of the quality data.*

TQM6. Extent to which quality data (cost of quality, defects, errors, scrap, etc.) are used as tools to manage quality.

TQM7. Extent to which suppliers are evaluated according to quality, delivery performance, and price, in that order.*

TQM8. Extent to which suppliers are selected based on quality rather than price or delivery schedule.

TQM9. Coordination among affected departments in the product/service development process.

TQM10. Quality of new products/services emphasized in relation to cost or schedule objectives.*

TQM11. Degree of automation of the process.*

TQM12. Extent to which process design is “fool-proof” and minimizes the chances of employee errors.

Multi-level firm performance (valued by the production manager).

Compared to the major competitors in the manufacturing industry over the last two years, please indicate the following performance of the firm you work from “1” = the worse to “7” = the best.

Quality performance (QP)

QP1. Product/service quality.

QP2. Productivity.*

QP3. Cost of scrap and rework as a % of sales.

QP4. Delivery lead-time of finished products/services to customer.*

Inventory management performance (IMP)

IMP1. Purchase material turnover.

IMP2. Total inventory turnover.

Note: Items with * have been deleted in the confirmatory factor analysis.

Table 1. Sample demographics.

Item		Number	Percent
Sub-categories of the manufacturing industry	Semi conductor	29	17.0
	Optoelectronics	28	16.4
	Motherboard	27	15.8
	Electronic devices	53	31.0
	Chemical, biotechnology and petroleum	13	7.6
	Steel, iron and metal	8	4.7
	Others	13	7.6
Number of employees	Under 500	83	48.5
	500 – 1000	43	25.1
	1001 – 2000	17	9.9
	Above 2000	28	16.4
Average sales revenue over the last two years	Less than \$US 100 million	62	36.3
	\$US 100 – \$US 499.9 million	77	45.0
	\$US 500 million - \$US 999.9 million	10	5.8
	\$US 1 billion – \$US 5 billion	13	7.6
	Over \$US 5 billion	9	5.3

Note: Sample size = 171.

Table 2. Descriptive statistics and pearson correlations.

Variables	Mean	Standard deviation	1	2	3	4	5	6
1. P-O fit of PMS	4.865	0.643	1.000					
2. TQM	5.207	0.635	0.219***	1.000				
3. ROA	0.164	0.085	0.177**	0.280***	1.000			
4. STOCK	0.274	1.887	-0.150*	-0.005	-0.058	1.000		
5. Quality performance	5.208	0.683	0.218***	0.448***	0.546***	-0.044	1.000	
6. Inventory management performance	5.757	0.818	0.214 ***	0.302	0.817	-0.074	0.480	1.000

Note: P-O fit of PMS refers to person-organisation fit of performance measurement systems. TQM refers to total quality management.

*p < 0.1 ; **p < 0.05 ; ***p < 0.01.

Table 3. Measurement model.

	Factor loading*	Corrected item-total correlation	Overall Cronbach's alpha	Composite reliability	AVE
Person-organisation fit of performance measurement systems (P-O fit of PMS)			0.892	0.875	0.416
PS1	0.714	0.639			
PS2	0.778	0.700			
PS3	0.670	0.583			
PS4	0.697	0.621			
PS5	0.781	0.707			
PS6	0.690	0.601			
PS7	0.666	0.588			
PS8	0.701	0.613			
PS10	0.725	0.643			
PS11	0.705	0.630			
Total quality management (TQM)			0.916	0.916	0.578
TQ1	0.752	0.673			
TQ2	0.764	0.689			
TQ3	0.798	0.728			
TQ4	0.859	0.798			
TQ6	0.824	0.757			
TQ8	0.803	0.732			
TQ9	0.807	0.738			
TQ12	0.736	0.654			
Quality performance			0.764	0.774	0.632
QP1	0.900	0.619			
QP3	0.900	0.619			
Inventory management performance			0.744	0.707	0.548
IP1	0.892	0.592			
IP2	0.892	0.592			

Note: All loadings are significant at 0.01 level. The results of financial performance were not in the analysis due to the data collected from database rather than the questionnaire.

Table 4. Average variance extracted and square of correlations between constructs.

Constructs	1	2	3	4
1. Person-organisation fit of performance measurement systems (P-O fit of PMS)	0.416			
2. Total quality management (TQM)	0.048	0.578		
3. Quality performance	0.048	0.201	0.632	
4. Inventory management performance	0.046	0.091	0.230	0.548

Note: Average Variance Extracted (AVE) is shown on the diagonal of the matrix. The results of financial performance were not in the analysis due to the data collected from database rather than the questionnaire.

Table 5. Overall model fit indices.

Criterion	Research model	Recommended cut-off value
Absolute fit measures		
χ^2	$p > 0.1$	$p > 0.1$
χ^2 /d.f.	1.076	$\leq 2^{**}$; $\leq 3^*$
GFI	0.902	$\geq 0.90^{**}$; $\geq 0.80^*$
RMR	0.044	$\leq 0.05^{**}$; $\leq 0.08^*$
RMSEA	0.021	$\leq 0.05^{**}$; $\leq 0.08^*$
Incremental fit measures		
NFI	0.907	$\geq 0.90^{**}$
IFI	0.993	$\geq 0.90^{**}$
AGFI	0.860	$\geq 0.90^{**}$; $\geq 0.80^*$
CFI	0.993	$\geq 0.90^{**}$
Parsimonious fit measures		
PGFI	0.631	The higher, the better
PNFI	0.690	The higher, the better

Note: ** acceptable and * marginal refer to the degree of acceptability.

Table 6. Results of structural equation model.

	Independent variables	Dependent variables	Path coefficient	t-value	Results
H1	P-O fit of PMS	TQM	0.226**	2.516	Support
H2a	TQM	Financial performance	0.603**	2.262	Support
H2b	TQM	Quality performance	0.288***	2.900	Support
H2c	TQM	Inventory management performance	0.527***	4.876	Support
H3a	P-O fit of PMS	Financial performance	0.591***	2.621	Support
H3b	P-O fit of PMS	Quality performance	0.266***	1.857	Support
H3c	P-O fit of PMS	Inventory management performance	0.168*	2.988	Support

Note: P-O fit of PMS refers to person-organisation fit of performance measurement systems. TQM refers to total quality management. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

Table 7. Direct, indirect and total effects of model constructs.

Independent variables	Dependent variables	Direct effects	Indirect effects	
			trough TQM	Total effects
P-O fit of PMS	TQM	0.226**		0.226
Financial performance	P-O fit of PMS	0.591***	0.136	0.727
	TQM	0.603**		0.603
Quality performance	P-O fit of PMS	0.266***	0.065	0.331
	TQM	0.288***		0.288
Inventory management performance	P-O fit of PMS	0.168*	0.119	0.287
	TQM	0.527***		0.527

Note: P-O fit of PMS refers to person-organisation fit of performance measurement systems. TQM refers to total quality management. * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.

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QP4. Delivery lead-time of finished products/services to customer.*

Inventory management performance (IMP)

IMP1. Purchase material turnover.

IMP2. Total inventory turnover.

Note: The most of our focus is rated by the production manager, except for the items on the recognition of the importance of PMS from the employee perspective. Items with * have been deleted in the confirmatory factor analysis.

